Installing GDS Windows Build Tools

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1 Introduction

The build tools for GDS are all Open Source tools, and are available on both Windows and Lynx. This document is specific to Windows.

For hardware document access only, do sections 1.1, 2, 3, 9.1.

The primary integrated development environment is Gnu Emacs.

For concreteness, we assume all downloads are stored in subdirectories of `c:/Downloads`, and installed to subdirectories of `c:/Gnu`, unless otherwise specified.

1.1 Environment Variables

Only the `HOME` environment variable needs to be declared in the Windows environment; others are defined in `~/.emacs`. `HOME` declares where `~/.ssh`, `~/.emacs`, `~/.bash_profile` are found, and provides a place to store other configuration information.

To declare the `HOME` environment variable, navigate to `Control Panel | System | Advanced | Environment`. Set `HOME` to a directory of your choice, for example `e:\Stephe`.

If you don't have a prefered HOME directory, you can use the Cygwin default of `c:/home/<user>`.

1.2 CD

As an alternative to downloading everything, the GDS Windows Installation CD constains the basic files needed.

To burn the CD, use Roxio drag-to-disk format. This allows full Win32 file names, which is necessary for the Cygwin installer.

Here is the list of files on the CD, grouped by download source:

Cygwin `setup.exe`, others too numerous to list.

GNAT
1. Download from ACT FTP, at https://www1.adacore.com/gnattracker/
2. Get customer number and password from Stephe
3. Download to directory `C:/Downloads/GNAT/5.03a`
4. `asis-5.03a-src.tgz`
5. `gnat-5.03a-nt.exe`

stephe
- Download from `http://www.toadmail.com/~ada_wizard/ada/arm.html`
- Download to directory `C:/Downloads/GNAT/5.03a`
- ARM 95-1-20031207 (`arm95-1-20031207.info.tar.gz`)
- Annotated ARM 95-1-20031207 (`aarm95-1-20031207.info.tar.gz`)

Emacs
1. From ftp://ftp.gnu.org
2. Download to directory `C:/Downloads/Emacs`
3. `emacs-21.3-fullbin-i386.tar.gz`

2   Cygwin

1. From http://sources.redhat.com/cygwin/ click on "install cygwin now" to download `setup.exe` to directory `C:/Downloads/Cygwin`.

2. Create a desktop icon for `setup.exe`, so you can easily run it later to refresh Cygwin.

3. Run `setup.exe`. Follow the wizard; here are some of the settings you need:

   (a) install to `C:/`. The Cygwin installer says this is not a good idea; ignore that. This makes using other packages easier, since Cygwin mounts `C:/` as `/`, so it gives paths on the C drive are `/...` rather than `/cygdrive/c/...`.

   (b) install for "all users", or "just me" if you don't have admin privs.

   (c) default text file type "unix"

   (d) local package directory `C:/Downloads/Cygwin`

   (e) select `ftp://ftp.nas.nasa.gov`

   (f) select packages:
       i. base
       ii. Devel/cvs
       iii. Devel/make
       iv. Net/openssh
       v. Text/aspell
       vi. Utils/cygutils
       vii. Utils/patch

4. If you have a home directory, edit `c:/etc/passwd` to set your home directory correctly. The last line should start with your login name, and end with `/home/<login>:/bin/bash`; change that to `/cygdrive/c/<your_home>:/bin/bash`. This is used by ssh.

5. People often have lots of stuff installed in Windows, which might interfere with the GDS development environment. Consider specifying your PATH completely in `~/.bash_profile`:

```
PATH=/<your_home>/bin
PATH=$PATH:/Gnu/GNAT-5.03a/bin
PATH=$PATH:/texmf/miktex/bin
PATH=$PATH:/bin
PATH=$PATH:/winnt/system32

export PATH
```

2.1   Cygwin X server

To use the Cygwin X server:

1. Additional Cygwin packages:

    (a) X11/xorg-x11-xwin
    (b) X11/xterm

2. Add the X server stuff to various paths:

    (a) In `.bash_profile`: `PATH=$PATH:/usr/X11R6/bin`
    (b) In `.emacs`:
        i. (setenv "MANPATH" (concat (getenv "MANPATH") ":/usr/X11R6/man"))
        ii. `"/usr/X11R6/bin"` in exec-path

3. In `.bash_profile`, add: `export DISPLAY=127.0.0.1:0.0` Setting `DISPLAY` allows later commands like `xhost` to find the X server. This aught to work if it is in `~/bin/xwindows.sh`, but for some reason it doesn't.

4. Create a shell script `~/bin/xwindows.sh` to run Cygwin X Windows in a nice way:

    ```
    XWin -clipboard -multiwindow -silent-dup-error &
    ```

    See the XWin man page, and `XWin --help`, for more info.

5. Example of connecting to a machine called 'gont', from the Cygwin machine 'shevek'. In cygwin bash:

    (a) type `xwindows.sh`. This starts the X server.
    (b) `xhost gont.gsfc.nasa.gov`, to allow gont to use the X server.
    (c) `ssh gont`
    (d) On gont: `emacs --display=shevek.gsfc.nasa.gov:0 &`

2.1.1   Cygwin refresh

RedHat releases updates to Cygwin quite often. These usually fix bugs, add features, and only occasionally break things. Thus our policy is to keep up-to-date with the RedHat releases.

1. Before running setup, exit all cygwin processes.

2. Run `setup.exe` (via the desktop icon).

3. Leave everything defaulted from the previous install and hit next a lot.

3 ssh

`ssh` is the secure shell, which is used for access to the CVS repository, and to machines over the network.

ssh-agent provides access to all machines on the network via one password. The setup process given here enables that access by distributing secure keys. It is correct for all operating systems.

1. Ask Stephe to get you an account on osgroup (the 582 CVS server), with access to:

   - /export/services/cvs/public/emacs
   - /export/services/cvs/public/ada
   - /export/services/cvs/gds

2. Also register your machine in the firewall protecting osgroup, by submitting a ticket to code 582 support at http://adminserver.gsfc.nasa.gov/582-support/index.html

3. In a bash shell:

   (a) `echo "export CVS_RSH=ssh" >> ~/.bash_profile`.

   (b) `ssh-keygen -t rsa`
   This prompts for:
      - File in which to save the key. The default file is `~/.ssh/id_rsa`; keep it by hitting return.
      - Passphrase. This can be the same as your login password.

   (c) `scp ~/.ssh/id_rsa.pub <user>@osgroup.gsfc.nasa.gov:~/`

   (d) `ssh <user>@osgroup.gsfc.nasa.gov`

   (e) Change your password, via `passwd`.

   (f) if .ssh does not exist on osgroup:
      i. `mkdir .ssh`
      ii. `chmod 755 .ssh`

   (g) `cat id_rsa.pub >> .ssh/authorized_keys`

   (h) `chmod 600 .ssh/authorized_keys`
   owner read-write only

   (i) verify that your home directory has no write privs higher than owner.

   (j) `rm id_rsa.pub`

   (k) `exit`

Note that the only way to change the passphrase is to run `ssh-keygen` again, which generates a new key, which must then be copied to osgroup again.

3.0.2   ssh-agent

All processes that need access to other machines must be started from a shell
that is a child of the ssh-agent process.

To simplify this, we create an icon that starts ssh-agent:

1. Copy the current Cygwin icon, name it 'ssh-agent bash'.

2. Right click on the new icon, select Properties.

3. Select the Shortcut tab.

4. In the Target field, change it to `C:/Gnu/cygwin/bin/ssh-agent.exe /usr/bin/bash.exe
   --login`

5. Click <ok>.

Test the ssh-agent setup:

1. Double-click on the 'ssh-agent bash' icon.

2. Type `ssh-add`, and provide the passphrase.

3. `ssh <user>@osgroup.gsfc.nasa.gov`
   This verifies that a password is not required to access the osgroup account.
   If it is still required, then ssh setup was not successful.

4. `exit`

4   Emacs

On Windows, we use the non-Cygwin version of Emacs, partly because the GNAT compiler is also non-Cygwin, and partly because the Cygwin version of Emacs runs under an X server, and we prefer the Microsoft window manager.

1. Download `emacs-21.3-fullbin-i386.tar.gz` from ftp://ftp.gnu.org/pub/gnu/windows/emacs/latest to directory `C:/Downloads/Emacs`.

2. Install Emacs. In a bash shell:

```
cd c:/Gnu
mkdir Emacs
cd Emacs
tar zxf ../../Downloads/Emacs/emacs-21.3-fullbin-i386.tar.gz
```

4.1   Customizations

On all operating systems, we also use Stephe's customizations, which are stored in the branch CVS server.

Emacs is started from a bash shell that is under `ssh-agent`, so it can access the CVS repository transparently.

1. Install Stephe's customizations. In a bash shell under ssh-agent (`<user>` is replaced by your username on osgroup):

```
cd c:/Gnu/Emacs
mkdir site-lisp
cd site-lisp
cvs -d <user>@osgroup.gsfc.nasa.gov:/export/services/cvs/public/emacs \
    checkout emacs_stephe
cvs -d <user>@osgroup.gsfc.nasa.gov:/export/services/cvs/public/emacs \
    checkout emacs_stephe_site_lisp
cp emacs_stephe/example-windows.emacs ~/.emacs
cp emacs_stephe/stephe_settings.el emacs_stephe/<user>_settings.el
c:/Gnu/Emacs/emacs-21.3/bin/runemacs.exe
```

The last command starts Emacs.

2. Edit `~/.emacs` (select File — Open):

   (a) Replace all `<user>` with your login (select Edit — Search — Replace).

3. Tell bash under Emacs to use a simpler prompt: create `~/.emacs_bash`, containing: `export PS1="\u@\h: "`.

4. Create a shell script `~/bin/emacs.sh` to start Emacs under ssh-agent (select File — Open to create a new file). For example:

```
# start emacs from ssh client with nice parameters
ssh-add
c:/Gnu/Emacs/emacs-21.3/bin/runemacs.exe --geometry=120x45-0+0
```

5   TeX

MikTeK is an implementation of TeX and LaTeX for for Windows. We use it for all documents.

1. Download `small-miktex-2.4.1477.exe` from http://www.miktex.org/setup.html to the directory `C:/Downloads/TeX`.

2. Download MiKTeX packages. Run `small-miktex-2.4.1477.exe`. Indicating version 2.4.1477. Reston, Va, Aleron, is OK. Follow the prompts:

   (a) Select "Install MikTeX for everyone".

   (b) Select directory `C:/texmf`.

   (c) Program folder name MikTex

   (d) Select "Create local TEXMF tree", path to root folder `c: localtexmf`.

   (e) Select "Don't incorporate existing TEXMF folder trees now".

   (f) Wait for installation to complete.

3. Install extra MiKTeX packages:

   (a) Run `Start | MikTex | MikTex Package Manager`.

   (b) Under "Package Repositry"

      i. Select "Internet"

      ii. For the package repository, select "USA ftp://ftp.duke.edu..." works OK. The synchronization with the repository takes a minute or more.

   (c) type in the name "fancyhdr" in the name box and hit the filter button

   (d) Select "fancyhdr", click $<+>$ in toolbar, wait for installation. Documentation for this package is in `c:/texmf/doc/latex/fancyhdr/fancyhdr.pdf`

4. Tell Windows to associate `.dvi` with Yap (Yet Another Previewer): select `Start | Programs | MiKTeX | DVI Viewer`. Select the View/Options menu item and select the Advanced tab. Be sure the item marked as "Yap should check to see whether it is the default viewer" is selected and click "OK".

5. In `~/.emacs` :

   (a) Add `c:/texmf/miktex/bin` to `exec-path`, before cygwin

6   Misc

We distribute many documents as PDF on a web page. Thus a PDF viewer and Web browser are needed.

For PDF viewing, Acrobat version 6 or 7 is recommended.

For Web browsing, Netscape is recommended.

However, Acrobat insists on installing the Netscape plugin that displays PDF files inside Netscape, rather than in a separate Acrobat application window. This is inconvenient when viewing many documents at once. To disable this, delete the file `Adobe/Acrobat 7.0/Acrobat/Browser/nppdf32.dll`, and also `Netscape/plugins/nppdf32.dll`

7   GNAT

7.1   Compiler

GNAT uses the Cygwin dll for the debugger, but installs a different version of
the dll than installed by Cygwin. So we have to fix that.

1. Download from ACT FTP; access https://www1.adacore.com/gnattracker/
   using your web browser, enter our customer number (644 for GDS), and
   your email address and password (Stephe has to create your password).
   Individual files can be downloaded by clicking on desired file (the File
   Download dialog will appear). Do this, rather than selecting a group of
   files. If you select a group of files, it gives you a tar file with path infor-
   mation, which we don't want.

   Files to download, to directory `C:/Downloads/GNAT/5.03a`:

   (a) `asis-5.03a-src.tgz`
   (b) `gnat-5.03a-nt.exe`

   Older versions of GNAT had a separate "gnatwin" file; that is gone as of
   5.03a. In addition, the info version of the documentation is installed by
   gnat-5.03a-nt.exe; we used to have to do that separately.

2. From `http://www.toadmail.com/~ada_wizard/ada/arm.html`, download,
   to directory `C:/Downloads/GNAT/5.03a`::

   • ARM 95-1-20031207 (`arm95-1-20031207.info.tar.gz`)
   • Annotated ARM 95-1-20031207 (`aarm95-1-20031207.info.tar.gz`)

3. Run `gnat-5.03a-nt.exe`. It will offer to uninstall any current GNAT;
   say "no", in case we need to back up a version.

   (a) Install to `c:\Gnu\GNAT-5.03a`
   (b) Do *not* 'make gnat tools accessible from the command line'; that just
       adds junk to your Windows PATH.

4. In bash:

   ```
   cd c:/Gnu/GNAT-5.03a/bin
   mv cyggnat.dll cyggnat-save.dll
   cp ../../cygwin/bin/cygwin1.dll cyggnat.dll
   cd ../doc/gnat/info
   tar zxf /Downloads/GNAT/5.03a/arm95-1-20031207.info.tar.gz
   tar zxf /Downloads/GNAT/5.03a/aarm95-1-20031207.info.tar.gz
   ```

5. In `c:/Gnu/GNAT-5.03a/doc/info`, create file named `dir`, containing:

   ```
   ^_
   File: dir Node: Top

   * Menu: The list of major topics begins on the next line.

   * Annotated Ada Reference Manual:    (aarm95-1).
   * Ada Reference Manual:     (arm95-1).
   * Gnu Compiler Collection: (gcc).
   * Gnu Debugger:            (gdb).
   * GNAT Reference:          (gnat_rm).
   * GNAT User Guide:         (gnat_ugn).
   ```

   Note that `^_` is one control character, produced in Emacs by `C-q C-_`. An easy way to create this file is to copy it from a previous installation.

6. In `~/.emacs` :

   (a) `(add-to-list 'Info-default-directory-list "c:/Gnu/GNAT-5.03a/doc/info")`

   (b) Add or replace, as appropriate, `"c:/Gnu/GNAT-5.03a/bin"` to exec-path (before cygwin)

7. Restart Emacs to let these changes take effect.

7.2   ASIS

Ada Semantic Interface Specification (ASIS) is used in the `Auto_Text_IO` tool, which automatically generates text input and output packages for most Ada types. This is useful for debug test drivers.

1. In a bash shell:

   ```
   cd c:/Gnu/Gnat-5.03a
   tar zxf /Downloads/Gnat/5.03a/asis-5.03a-src.tgz
   ```

2. In `c:/Gnu/Gnat-5.03a/asis-5.03a-src/Makefile.stub`, change the value of `INSTALL_DIR` to `c:/Gnu/Gnat-5.03a/local`.

3. In a bash shell:

   ```
   cd c:/Gnu/Gnat-5.03a/asis-5.03a-src/
   make install
   ```

4. create a bin directory to hold `auto_text_io`. In `bash`:

```
mkdir c:/Gnu/GNAT-5.03a/local/bin
```

5. In `~/.emacs`, add environment variables:

   ```
   (setenv "GNAT_ASIS" "c:/Gnu/GNAT-5.03a/local/lib/gnat")
   (setenv "INSTALL_BIN" "c:/Gnu/GNAT-5.03a/local/bin")
   ```

   `GNAT_ASIS` is the location of the `asis.gpr` file, `INSTALL_BIN` is the location
   to install the `auto_text_io` executable.

6. In `~/.emacs`, add `c:/Gnu/GNAT-5.03a/local/bin` to your path.

8   Misc tools

These tools are only occasionally used; you may not need them.

8.1   Elisp manual

The elisp manual is documentation on the Emacs Lisp language. It is not included in the standard Emacs distribution, but comes in handy sometimes.

1. Download `elisp-manual-21-2.8.tar.gz` from ftp://ftp.algx.net/pub/gnu/emacs/ (or another Gnu mirror) to `c:/Downloads/Emacs`.

2. In bash:

   ```
   cd c:/Gnu
   tar zxf ../Downloads/Emacs/elisp-manual-21-2.8.tar.gz
   cd elisp-manual-21-2.8/
   cp elisp elisp-* ../Emacs/emacs-21.3/info
   cd ../Emacs/emacs-21.3/info
   install-info elisp dir
   ```

Elisp now appears in the Emacs info menu.

8.2   GhostScript

GhostScript allows Emacs to print formatted text to a color printer.

Note that Cygwin ghostscript does not include Windows printing support.

1. Download http://prdownloads.sourceforge.net/ghostscript/gs851w32.exe to `c:/Downloads/Misc`.

2. Run `gs851w32.exe`. This is a WinZip self-extractor; it brings up the GhostScript installer.

3. Install to `c:/Gnu/gs`.

4. In `~/.emacs`, verify that the Windows printing section has the right path to `gsprint.exe`:

   ```
   ;; Windows printing
   (setq ps-lpr-command "c:/Gnu/gs/gsview/gsprint.exe")
   (setq ps-lpr-switches '("-q" "-dNOPAUSE" "-dBATCH" "-sDEVICE=mswinpr2" "-query"))
   (setq ps-printer-name t) ; contrary to help for this item
   ```

Now the Emacs menu `File | Postscript Print Buffer` will print the current
buffer to the printer, with headers, fonts and colorization. A Windows printer
select dialog box will open first, letting you chose the printer.

8.3   Maxima

Maxima is a symbolic algebra system; we use it to document derivations of
algorithms. The primary web site is http://maxima.sourceforge.net/.

1. Download `maxima-5.9.1.exe` from http://maxima.sourceforge.net/ to `c:/Downloads/Misc`.

2. Run `maxima-5.9.1.exe`. Agree to the license, etc.

3. Install to `c:/Gnu/maxima-5.9.1`

4. In `~/.emacs`:

   (a) add `"c:/Gnu/maxima-5.9.1/bin"` to exec-path.
   (b) add `"c:/Gnu/Maxima-5.9.1/share/maxima/5.9.1/emacs"` to load-
       path.

8.4   webcheck

`webcheck` is used to verify that the links on a web page are correct. We use it
to help maintain the GDS web page.

1. Download `webcheck.exe.gz` from `http://www.toadmail.com/`~`ada`_`wizard/`
   `ada/webcheck.html` to `c:/Downloads/Misc`.

2. In bash:

   ```
   cd c:/
   cd $INSTALL_BIN
   gunzip /Downloads/Misc/webcheck.exe.gz --stdout > webcheck.exe
   ```

3. In `~/.emacs`, ensure that `c:/Projects/GDS/local/bin` is in your PATH.

9   GDS source

The GDS source code is kept in the branch CVS server.

In bash:

```
mkdir -p c:/Projects/GDS
cd c:/Projects/GDS

mkdir auto_text_io
mkdir common
mkdir sdo
mkdir sal
mkdir makerules

cd auto_text_io
cvs -d <user>@osgroup.gsfc.nasa.gov:/export/services/cvs/public/ada \
    checkout -d main Auto_Text_IO
cd ../common
cvs -d <user>@osgroup.gsfc.nasa.gov:/export/services/cvs/gds \
    checkout -d main common
cd ../sdo
cvs -d <user>@osgroup.gsfc.nasa.gov:/export/services/cvs/gds \
    checkout -d main sdo
cd ../sal
cvs -d <user>@osgroup.gsfc.nasa.gov:/export/services/cvs/public/ada \
    checkout -d main SAL
cd ../makerules
cvs -d <user>@osgroup.gsfc.nasa.gov:/export/services/cvs/public/ada \
    checkout -d main Makerules
```

where `<user>` is replaced by your username on osgroup.

In Emacs, in `~/.emacs`, add environment variables:

```
(setenv "AUTO_TEXT_IO" "c:/Projects/GDS/auto_text_io/main")
(setenv "GDS_COMMON" "c:/Projects/GDS/common/main")
(setenv "MAKERULES" "c:/Projects/GDS/makerules/main")
(setenv "SAL" "c:/Projects/GDS/sal/main")

(setenv "GNAT_VERSION" "5.03a")
(setenv "OS_VERSION" "Windows_2000")
```

Also add (`getenv "INSTALL_BIN"`) to your path.

`Auto_Text_IO` must be built first; it generates the `Text_IO` packages for SAL, which are used in GDS debug executables. Then GDS can be built.

In file `c:/Projects/GDS/auto_text_io/main/Build/x86_gnu_windows_release/Makefile`, run `make -r all install`

In file `c:/Projects/GDS/common/main/Build/x86_gnu_windows_test/Makefile`, run `make -r all`.

GDS code is now built.

9.1   GDS hardware docs only

If you only want the hardware documentation, and not the full GDS, use this section.

In bash under ssh-agent:

```
mkdir -p c:/Projects/GDS/common
cd c:/Projects/GDS/common
cvs -d <user>@osgroup.gsfc.nasa.gov:/export/services/cvs/gds checkout -d
     hardware_doc common/hardware_doc

mkdir -p c:/Projects/GDS/sdo
cd c:/Projects/GDS/sdo
cvs -d <user>@osgroup.gsfc.nasa.gov:/export/services/cvs/gds checkout -d
     hardware_doc sdo/hardware_doc
```

10   SDO ACE Flight Software

We run the SDO ACE Flight software in the GDS in a pure software simulation.

The prototype SDO ACE Flight Software is in a CVS repository on `sdo-extremeuv.gsfc.nasa.gov`. See Stephe to get an account, and to get your machine in the firewall.

Set up ssh on sdo-extremeuv, as for osgroup.

We use a branch of the flight code, so we don't disturb the flight project.

Well, except we don't have write privs in the fsw-exec tree yet.

In bash:

```
cd c:/Projects/GDS/
```

```
mkdir -p flight/mathlib
cd flight/mathlib
cvs -d <user>@sdo-extremeuv.gsfc.nasa.gov:/home/cvs \
    checkout -d work_gds_pure_sw_ace -r common_work_gds_pure_sw_ace  mathlib

mkdir -p flight/fsw-exec
cd flight/fsw-exec
cvs -d <user>@sdo-extremeuv.gsfc.nasa.gov:/home/cvs \
    checkout -d main fsw-exec
```

where <user> is replaced by your username on sdo-extremeuv.

We do *not* use the makefiles in the flight CVS directories, we use our own makefiles.